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Indian Standard

METHOD FOR TESTING SUITABILITY OF BINS FOR SAFE STORAGE OF FOOD GRAINS

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METHOD FOR TESTING SUITABILITY OF BINS FOR SAFE STORAGE OF FOOD GRAINS

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(*Continued from page* 1)

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Indian Standard

METHOD FOR TESTING SUITABILITY OF BINS FOR SAFE STORAGE OF FOOD GRAINS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 June 1975, after the draft finalized by the Storage Structures and Storage Management Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 Various types of bins for storage of food grains are being manufactured in the country. Comparative suitability of each type of bin for storage has to be ascertained in regard to various physical and chemical parameters of stored grains before recommending it to the farmers. Therefore, with a view to ensuring uniform testing procedure and interpretation of results, this Indian Standard has been formulated.

0.3 This standard is based on the extensive trials on judging the relative suitability of various storage bins carried out at the Indian Grain Storage Institute, Hapur.

1. SCOPE

1.1 This standard prescribes method for testing the suitability of various bins for storage of food grains.

2. TERMINOLOGY

2.1 For the purpose of this standard the definitions of various terms given in IS : 6151 (Part I)-1971* shall apply.

3. TESTS

3.0 The bins and the food grains shall be tested for the following parameters.

3.1 Moisture Migration — Determine the moisture content of the grains by taking a sample of 500 g from different predetermined points on top, middle and bottom portions at different depths and on East, West, North and South. Samples may be drawn with the help of a deep bin probe or a thermo-sampler (*see* IS : 2821-1964*).

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*Storage management code: Part I Terminology.

3.1.1 *Method* — Determine the moisture content by hot air oven method as given in IS : 4333 (Part II)-1967†.

3.1.2 *Frequency of Testing* — The moisture content shall be tested at monthly intervals.

3.2 Temperature Gradient — Measure tne temperature at different points in the grain to find out the fluctuations in temperature as compared to ambient temperature.

3.2.1 *Method* — Fix permanently three temperature cables (thermistors) in outdoor bin at different places, one each at East, West, about 7·5 cm away from the wall of the bin and one on the top centre of the bin about 7·5 cm below the grain surface. Fix the temperature sensing tips on East, West and on the top centre of the bin. These cables should be connected with a junction box (keyboard) from which with the help of a suitable temperature recorder, record the temperature of the grain at all the three points. In case of indoor bins, record the temperature at three points, namely, top, middle and bottom with the help of temperature recording probes. Thermo-samplers may be used for measuring temperature if thermistors are not available.

3.2.2 *Frequency of Testing* — Temperature should be measured twice in a day on alternate days at 0630 h and 1430 h with a view to recording the approximate minimum and maximum temperature of grain. Apart from this, 4-hourly observations may also be made to record the temperature at 0230 h, 0630 h, 1030 h, 1430 h, 1830 h and 2230 h for 24 h in each month to indicate temperature changes in the grain.

3.3 Suitability for Fumigation — Test the efficacy of a fumigant for disinfestation of grain in bins as given in IS : 7716-1975‡.

3.4 Water-Tightness — Test all the joints for water-tightness, especially in case of the outdoor bins.

3.4.1 *Method* — Direct a jet of water through a hose pipe at the joints on the walls and on the roof to determine whether there is any leakage of water through the joints.

3.5 Structural Strength — Carry out a close visual check upon all the joints of the structural members of the bin to determine any signs of weakness, deformation, overloading or incipient failure. Examine the above during filling, at the time the bin is fully loaded and during unloading when undue stresses are developed on the walls of the bin. In case of the outdoor bins, make the observations after stormy weather to find out whether the bin withstood the stresses without deformity.

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*Specification for thermo-sampler.

†Methods of analysis for food grains: Part II Moisture.

‡Method for testing efficacy of fumigation for disinfestation of grains in domestic bins.

3.6 Physical Quality of Grain — Examine the sample of grain drawn as in **3.1** outwardly and record abnormal smell, if any. Carry out physical test of grain using 50 g of sample for mould damaged, discoloured, touched, sprouted, and weevilled grain and express the result in percentage.

3.6.1 *Method* — Determine the physical quality of grains according to IS : 4333 (Part I)-1967*.

3.6.2 *Frequency of Testing* — The grain quality shall be tested at monthly intervals.

3.7 Germination Test — Draw the sample as in **3.1** and carry out the germination test of the grains according to the method prescribed in Appendix A of IS : 6894-1973†.

3.8 Insect Infestation

3.8.1 *Visual Infestation*

3.8.1.1 *Method* — Take 50 g of sample from the sample drawn in **3.1**, sieve and count the species and number of insects.

3.8.1.2 *Frequency* — The test for infestation shall be done fortnightly.

3.8.2 *Hidden Infestation* — Take one hundred grains from the sample drawn as in **3.1** and find out hidden infestation by Ashman Simon Hidden Infestation Detector. Calculate percentage of hidden infestation by taking the average of 3 replications (*see* IS : 6261-1971‡).

3.9 Mould Damage — Draw the sample as in **3.1** and determine the mould growth by the method given in **3.9.1**.

3.9.1 *Method* — Subject the grain sample intended for the detection of internal mould to surface sterilization. Take the sample in perforated cups (stainless steel) to facilitate easy wetting of the grains and subsequent quick drying. Fill the cup with grains to the three-quarters capacity and immerse for one minute in 0·1 percent mercuric chloride solution and then transfer for 1 minute to 70 percent alcohol, after a brief immersion in sterile distilled water. After final rinse in sterile distilled water, place 50 grains in one of the general-purpose media (Czapek's-Dox, potato-dextrose-agar, malt extract-agar, rose bengal streptomycin-agar) for the cultivation of fungi. After plating under aseptic condition incubate the plates at room temperature for 5 days before taking the count of the grains having mould growth. Express the results in terms of percentage of grain having mould infection.

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*Methods for analysis for food grains: Part I Refractions.

†Specification for malting barley.

‡Methods of analysis for detection of insect and rodent contamination in grains and milled products.

3.10 Chemical Quality of Grain

3.10.1 *Free Fatty Acidity* — Draw the sample as in **3.1** and use it for determination of free fatty acidity by the method given in Appendix F of IS : 3137-1965*.

3.10.1.1 *Frequency* — Free fatty acidity shall be determined quarterly.

3.10.2 *Alcoholic Acidity* — Draw the sample as in **3.1**, grind and determine the alcoholic acidity as prescribed in Appendix F of IS : 1155-1968†.

3.10.2.1 *Frequency* — The alcoholic acidity shall be determined quarterly.

4. REPORT OF RESULTS

4.1 Determine various parameters of the grains before and after storage and report the results.

4.2 The bins shall be considered suitable for storage if there is no appreciable difference in the pre- and post-storage data.

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*Specification for Indian multipurpose food flour.
†Specification for wheat *ATTA* (*second revision*).

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Definition*
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	Pascal	Pa	1 Pa = 1 N/m^2

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